Teck American Incorporated Response to EPA Comments - UCR Draf BMI Tissue Sampling QAPP
EPA Comments on the Upper Columbia River Draft Quality Assurance Project Plan (November 2014) for Benthic Macro-Invertebrate Tissue Sampling Dated November 16, 2016

General Comment Number	EPA General Comment	TAI Response
1	Remove infaunal and epifaunal BMI sampling from the draft benthic macroinvertebrate (BMI) tissue QAPP. The QAPP lists infaunal and epifaunal BMI tissue sampling as a necessary study goal (Section A7.2, page A-9; Section A7.4.1, page A-13); however, sampling will only be opportunistic and occur at the same locations as planned mussel and crayfish sampling (Section A7.3.1, page A-11). These infaunal and epifaunal BMI may not use the same habitats as mussels and crayfish so the sampling strategy for mussels and crayfish may not be sufficiently robust to characterize the dietary exposure of wildlife to COPCs in infaunal and epifaunal BMI tissues. If sampling for infaunal and epifaunal BMI is a data gap then these samples should not be opportunistic and will need to be addressed under a more extensive sampling plan (i.e., a separate QAPP).	Infaunal and epifaunal sampling has been removed.
2	Include a study Goal to "Determine if COPC concentrations in mussel and/or crayfish are indicative of unacceptable risk to invertivorous fish." Specifically, white sturgeon feed to some extent on mussels and crayfish. The level of effort memorandum (LOE) from EPA to TAI for benthic macroinvertebrate tissue sampling explicitly identifies benthic macroinvertebrates as an important food source for multiple fish species, including sturgeon. The sturgeon LOE (EPA, 2010) describes the expectation that food web modeling will be used as one of the approaches to characterize risks to sturgeon and mussels are eaten by sturgeon[1]. Although not explicitly described in the LOE as a wildlife species, fish species that consume benthic invertebrates sampled under this QAPP are receptors whose exposure BMI tissues must be quantitatively evaluated in the BERA. COPC concentrations in dietary items for fish are also a measurement endpoint needed to address a risk question identified in the UCR Problem Formulation Expansion (2012) to determine if "…COPCs in the diets of fish utilizing habitats at the UCR Site [are] greater than toxicity thresholds for the survival, growth, or reproduction of fish." [1]This will necessitate the compilation of dietary dose toxicity reference values for fish consuming prey. Ingested dietary dose TRVs for fish are not as common in the literature as they are for birds and mammals, but some dietary dose TRVs for some metals do exist for fish. These TRVs will eventually need to be identified for use in the BERA.	DQO language was revised to include invertivorous fish.

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3	Describe additional mussel sampling from waters substantially deeper than 3 - 4 feet in order to collect benthic samples to which receptors are exposed. The proposed 3 - 4 feet maximum of water depth from which mussel samples are proposed to be collected (some crayfish were proposed to be collected in possibly deeper water due to their home range) is not sufficient to cover the potential depth range from which consumers obtain these foods. For example, sturgeon will forage riverine sediments at any depth and river otters can dive as deep as 60 feet. People may also gather food from mussel beds below typical drawdown depths. Additional sampling methodologies will be required as sample collection only in wadeable near-shore waters will exclude deeper waters to which some ecological receptors are exposed. The draft QAPP acknowledges that benthic macroinvertebrates are likely to be present in lower numbers at higher elevation portions of the drawdown zone; mussels in particular appear to have relatively low densities in the "normal" drawdown zone (down to about 1255') because this area is dewatered annually. As an example of this, US Fish and Wildlife Service (FWS) mussel surveys in 2012 documented (exposed) mussel populations at numerous locations throughout the reservoir near the 1233' elevation. When they returned to these locations in 2013 there were almost no mussels at the 1252' elevation at the majority of sites; the locations of the 2012 populations were under approximately 20' of water because the drawdown was less than in 2012. Mussel recolonization in the higher elevation drawdown zone is undocumented, and likely to be infrequent compared to deeper areas where populations are not exposed each year. However, it is assumed that during the proposed sampling period (i.e., late summer), the water level in Lake Roosevelt will be drawn down to a low enough elevation that benthic invertebrates will be present in the 3 - 4 feet of water below the water surface at whatever the surface elevation is of Lake Roosevelt during sampling. Few, if any, mussel tissue samples may be collected if this assumption is not met. To ensure that mussels are present, particularly longer lived species, the water elevation during sampling would have to be at or at least close to the historical low water elevation for the lake. There is no guarantee that these conditions will be met when sampling occurs, thus, it is recognized that there can be no guarantee that the proposed methods described in the QAPP will successfully collect the target invertebrates. The QAPP must expand its proposed sampling methodologies to include procedures that can successfully collect mussels from water at depths greater than 3 - 4 feet below surface water elevation. Methods could include divers (in late summer when visibility is expected to be better than in spring) and could still include shoreline surveys during the spring drawdown.	Sampling in waters deeper than wadeable depths has not been incorporated into the QAPP because of TAI's concerns about health and safety.

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4	The proposed timing for sample collection needs additional explanation and EPA recommends expanding the sample collection timing to multiple periods to collect samples for the various proposed tissue types. Sampling crayfish in the late summer may avoid issues associated with the crayfish molting, but it also occurs when there is an increase in body mass and thus the potential to decrease the measured concentration of contaminants in tissues. The sampling locations and timing may need to differ for each of the tissue types (i.e., mussels and crayfish). For example, the 2012 FWS mussel and crayfish sampling locations will not be in wadeable waters at fall reservoir levels, but could be located with divers. If these locations are identified for sampling it will also be important to sample exactly at the coordinates specified where previous surveys or reconnaissance have observed mussel beds as opposed to wadeable depths at the time of sampling. Another option may be to collect mussels during reservoir drawdown in the spring, which is the period when avian receptors feed on mussels. Additional locations were documented by FWS in 2013, which should be considered for sampling, as well as crayfish trapping locations, in order to increase the likelihood of successful sampling. Observations of live mussels and successful crayfish capture can be sporadic, even at locations where live animals have been previously observed; therefore increasing the number of potential sampling stations and selecting locations where animals have been previously observed/captured may increase the likelihood of successful capture. Proper planning also requires that the relevant life history (i.e., spawning and molding periods) be described in the QAPP to support the proposed sampling times and locations.	Sampling is proposed for early spring when the water level will be lowest. Sufficient information was not found to justify sampling in both spring and fall.
5	It is unlikely that both of these groups of organisms will occur at all 32 of the proposed sampling locations or any additional locations that are required in these comments. Identify which stations are specifically targeted for mussels, which for crayfish, and which for both. Describe which locations will potentially produce samples/data that are applicable for the BERA and HHRA and the minimum number of sampling locations needed to meet DQOs for the BERA, HHRA, and tissue chemistry data (i.e., minimum number of samples for mussels and crayfish, required spatial coverage, etc.). Provide a table reporting the number of samples for each species that are proposed to be collected in each reach of the Upper Columbia River and Lake Roosevelt.	The sampling design has been revised and text and tables have been added to address this comment.
6	Additional sampling locations upstream of Onion Creek are needed to better characterize exposures near the border. In fact, only five primary sites are targeted for sampling mussels and crayfish upstream of Marcus Flats. Include additional sampling from the border to Onion Creek. If these locations cannot be readily identified from existing data and resources then a site reconnaissance survey prior to sampling would be useful for identifying additional locations and appropriate habitats for BMI tissue sampling efforts.	Six composite samples each for mussels and crayfish are targeted for the area upstream of Onion Creek (i.e., approximately River Mile 730).
7	Describe the basis for proposing to collect 32 mussel and 32 crayfish tissue samples and how, if all are collected, this number of samples will meet the data quality objectives. For example, it would be reasonable to expect that the site may be divided into subareas of different habitats for dietary exposure modeling to wildlife and fish, even though the basis for these analyses has not yet been described in detail. This QAPP must demonstrate how the data proposed to be collected will meet the statistical demands of such a data evaluation (e.g., calculating 95UCLs)	The sampling design has been revised and text and tables have been added to address this comment.

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8	Describe the potential use of alternative sampling locations in the event that target organism tissues cannot be collected at the primary sampling locations.	The sampling design has been revised to cover sampling areas rather than specific locations, so there will be more flexibility in targeting specific locations based on field observations, and in adjusting locations as needed.
9	Describe how sample location selection was informed by previous sampling efforts, the presence of habitat suitable for target species, and the collection areas relevant to human health exposures. Estimates of sediment characteristics and metal concentrations were not highly successful at predicting the results of phase 2 sediment sample characteristics and may not be good predictors of sediment conditions in the channel margins where BMI tissue sampling is proposed. Therefore, suitable habitat, previous sampling success (based on experience or reports), and sufficient spatial coverage of the study area would be an adequate basis for proposed sample location selection. However, note that previously successful or unsuccessful sampling at FWS locations is not necessarily indicative of future sampling success or failure. Potential and likely habitats for target species should be identified. Although samplers are more likely to find live animals where they have previously been observed it should not be assumed that this will occur, particularly in areas where only small mussel populations were observed in previous surveys, and in areas that are frequently de-watered. Identify sufficient reserve stations to account for potentially unsuccessful sampling (e.g., twice the number of primary sampling locations).	The sampling design has been revised to select sampling locations based on suitable habitat, human use areas, USFWS sampling success, and spatial coverage of the area.
10	The draft BMI QAPP proposes 5 internal reference locations (between Kettle Falls and the Spokane River confluence) and no external reference locations. We do not know *a priori* that an internal reference sample location will meet reference location criteria. After sampling these data could potentially be assessed against criteria to determine if internal reference locations are accepted as such.	Internal reference locations have been removed.
10a	a. Describe criteria for acceptable internal reference sample locations for BMI tissue sampling.	
10b	b. Discuss the rationale for comparing tissue concentrations from site stations with 'internal reference' stations to identify those greater than 'background'. Can internal reference locations also comprise the background population (see Section A7.5.1 in the draft QAPP)?	
10c	c. Discuss how the mobility of crayfish, and mussels to a lesser degree, may affect any comparison between tissue samples and sediment or pore water samples collocated at proposed internal reference locations (i.e., a single sediment sample collected in water < 3 feet deep when crayfish samples will be collected from 20-60 foot water depths). Consider how the home range of sampled BMI compares with the near-field variability among co-located sediment samples (e.g., metal concentrations in 2005 and 2013 samples). Also consider how mussels are filter feeders that likely derive much of their COPC exposure from water-borne particulates.	
10d	d. Provide a table describing the site conditions at proposed internal reference locations that have been sampled previously (i.e., TOC, mPECQ, excess SEM, grain size, and the sample identifier used in any previous study). Also consider the potential for successfully sampling reference conditions when only 20 percent (2 of 10) of targeted internal reference samples from Phase 2 sediment sampling met the internal reference location acceptance criteria (i.e., Ref-5 and Ref-10b; Ref-1, Ref-2, Ref-3, Ref-4, Ref-6, Ref-7, Ref-8 had mPECQs > 0.2).	

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11	Include external reference locations among the proposed sampling locations . The basis for the selection of the proposed internal reference stations is unclear and inconsistent with the recently identified reference stations for Phase 2 sediment chemistry and sediment toxicity results. Including upstream reference sites or tributary reference sites in the study design is important because mussels are filter feeders that likely derive much of their exposure from water-borne particulates and crayfish exhibit only moderate site fidelity. Therefore, their exposure to sediment-associated contaminants may not be well characterized by a single sediment sample collected in water < 3 feet deep (i.e., crayfish samples will be collected from 20-60 foot water depths) adjacent to the tissue sample location. Hence, additional (out-of-site) reference samples are needed to characterize reference conditions within the study area (e.g., the Kettle River and lower San Poil River could be considered for collecting reference mussel samples). Assuming the sediment substrate types and compositions of the identified reference stations for Phase 2 sediment chemistry and toxicity are suitable for benthic macroinvertebrates, one could assume that these may also be suitable for mussel and/or crayfish reference stations (i.e., upstream of Trail and tributaries). Expand the discussion of reference stations to clarify the procedures, rationale, and basis for selection of reference stations and consideration of upstream sampling locations consistent with the Phase 2 sediment QAPP (TAI 2013). Different reference samples and locations will need to be identified for the different target species (e.g., *Anodonta* sp. and *Margaretifera* sp.).	External reference locations have been added for the HHRA samples. Consistent with the fish sampling event from 2009, no external reference locations are recommented for the BERA samples.
12	Provide the scientific rationale and references supporting the intended uses for these data (i.e., for calculating BSAFs) and the need to collect collocated sediment samples and pore water. It is not clear how these media represent exposures for organisms that are either filter feeders that receive their exposure from the water column, or have only moderate site fidelity and receive exposure from an area larger than can be described by a single grab sample. EPA does not require sediment and/or porewater samples for chemical analysis to be collected concurrently and co-located with the mussel and crayfish samples as part of the benthic macroinvertebrate QAPP. If TAI chooses to collect and analyze co-located sediment and porewater samples concurrently with tissue samples, EPA will evaluate the sediment and porewater data for its potential utility within the UCR RI/FS after the summary data report of the benthic macroinvertebrate sampling results has been received by EPA.	Collection of co-located sediment and porewater has been removed.
13	Coordination among field sampling teams, EPA and/or other government observers, and cultural resource observers when issues/questions arise during field sampling should be better defined. The procedure and processes finally developed and employed during the fall 2013 sediment sample collection seemed to work well (cultural resource observer approves samples, followed by government observer approves samples before they are retained, with as many issues as possible resolved by government and cultural resource observers on site, elevation to project managers when issues cannot be resolved in the field). This approach should be employed again during the benthic invertebrate sampling. Specific comments indicate where deviations from the QAPP or field decisions must be considered in consultation with EPA or its designees in the field.	Text was added to Section B2 and specific comments regarding coordination with EPA and its representatives in the field have been incorporated into the QAPP.
14	Constituents of Potential Ecological Concern (COPECs) proposed for analyses differs from the list of COPECs in the SLERA. The separate draft COPEC refinement report (TAI, 2015) should provide basis for refinements to COPECs for aquatic dependent wildlife but there is currently not a similar Constituents of Potential Concern (COPC) refinement for the Human Health risk assessment (HHRA) which will rely on these data. Add a list of current COPECs and constituents of interest (COIs) for the BERA (i.e., from the SLERA) and HHRA (i.e., from the HHRA work plan) that is considered in developing the final analyte list for BMI tissues.	Chemicals for analysis have been revised to reflect those discussed on the conference call with EPA on November 23, 2015.

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15	There is insufficient information in the draft QAPP describing how samples will be processed and analyzed by the lab after whole organisms are received by the lab.	Additional information has been provided to describe processing and analysis of whole organisms by the lab.

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1	A1	iii	Change the text as follows: EPA Regional Quality Assurance Manager	Text was revised as suggested.
2	A3	xiii	Change the text as follows: EPA Regional Quality Assurance Manager	Text was revised as suggested.
3	A4.1	A-1	Describe "...other benthic macroinvertebrates" (third paragraph).	Text was revised as suggested.
4	A4.1	A-1	Clarify "tissues" to be analyzed. Are these tissues consumed by wildlife? Distinguish between analysis of whole body and resected tissues.	Text was added to clarify the types of tissues to be analyzed for the HHRA and the BERA.
5	A4.2.1	A-2	Change the text describing EPAs regional QAP manager as follows: "The EPA region 10 quality assurance (QA) manager, Gina Grepo-Grove (or QA chemist designee). Responsibilities will include review and approval of QAPP and any subsequent addenda, as well as lab oversight as requested/necessary (i.e. data validation or lab observation)."	Text was revised as suggested. Donald Brown was added to replace Gina Crepo-Grove.
6	A4/A5	A-1/A-7	Add sturgeon to the list of receptors that will be evaluated using these data. The sturgeon LOE (EPA, 2010) describes the expectation that food web modeling will be used as one of the approaches to characterize risks to sturgeon and mussels are eaten by sturgeon. Also make this change noted as needed in other sections and appendices (e.g., section A7.2). See GC-2.	Text was revised to add invertebrate-feeding fish (e.g., white sturgeon) as a receptor.
7	A2.4.3	A-4	It is anticipated that coordination of proposed changes due to site specific conditions can be made in the field in consultation with EPA or its representative(s). Such language should be included in this section to clarify this. Revise the final sentence in this section as follows: "...the field supervisor will ensure that proposed changes are coordinated with EPA's project coordinators, EPA staff, and it's designates in the field or other designated EPA staff according to the established lines of communication..."	Text was revised as follows: "...the field supervisor will ensure that proposed changes are coordinated with EPA's project coordinators, its staff, and its authorized representative(s) in the field, and TAI's project coordinator according to the established lines of communication."
8	A4.2.4	A-4	Provide additional information regarding the qualifications of EcoAnalysts, Inc., the subcontractor selected for the taxonomic work with the collected invertebrates, to perform the required taxonomic identifications and the reliability of using photos to distinguish species.	Text was deleted because it is no longer applicable.
9	A5	A-7	Additional justification supporting the proposed sampling depth for mussels must be provided (or refer to the section containing this information). EPAs concerns include sturgeon that may forage deeper than wadeable depths. See GC-4.	The decision to sample only wadeable habitats is a policy decision by TAI based on health and safety issues rather than a technical issue, therefore a technical rationale was not included.
10	A5	A-7	Provide a figure of historic annual reservoir levels relative to the proposed sampling elevations to support the proposed timing and locations for sample collection.	A new figure was added (Figure A7-1) showing 2-yr and 10-yr average reservoir levels over an annual period.
11	A7.1.2	A-8	Additional justification supporting the proposed sampling time of year must be provided - such as referral to documents indicating the time(s) of year when residents collect target species - or refer to another section containing this information. Larger biomass is not by itself a legitimate concern driving sample collection timing for mussels or crayfish. See GC-4.	Text was revised to include justification (related to water level) of proposed sampling schedule.
12	A7.1.2	A-8	Add data validation to the schedule so that the final validated data delivery timeframe is clear.	Text was added to address the data validation timeline and overall project timeline.

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13	A7.2	A-9	One of the stated questions/goals of the draft plan is to "*Examine if statistical correlations exist between sediment and/or porewater properties and COPC concentrations in benthic macroinvertebrate tissue*." This fundamentally assumes a representative sampling and comparison of porewater will be achieved and previous attempts to collect pore water during phase 2 sediment sampling were problematic so that EPA has low confidence in the representativeness of these samples. Explain how pore water collected under this QAPP will overcome the challenges faced by the previous pore water sampling and result in high quality data. Also see GC-12.	Text was removed based on elimination of sediment and porewater sampling.
14	A7.2	A-9	The lack of sample replication at each station represents a substantial barrier to comparing macroinvertebrate tissue COPC concentrations at various locations in the study area. State how many replicates are needed at each station for conducting statistical analyses and indicate that this is met by the proposed study design. See GC-12.	Text regarding statistical correlations between sediment/porewater and benthic macroinvertebrate tissue was deleted because sediment and porewater samples are no longer proposed for collection. The QAPP has been revised to include the collection of composite samples, and field split samples are proposed for sample replication for a subset of samples, as described in Section A7.6.
15	A7.3	A-9	Step 3 - Identify Information Inputs: This section identifies the target analytes for inclusion in the invertebrate tissue study. EPA is providing separate comments on the draft aquatic COPEC refinement document and in the meantime the listed COPECs proposed for analysis under this QAPP are to be consistent with those retained at the end of the SLERA and in the HHRA work plan (See GC-14). Also note that the current text and tables are inconsistent with one another. The listed COPECs include Cr(III), but it is not clear that Cr(III) will be measured or if total chromium will be measured based Tables A7-3 or A7-4. In addition, total DDx is identified in Table A7-2, but is not identified in Section A7-3, Table A7-3, or A7-4, or A7-5; hence, it is not clear that DDTs are included in the list of analytes that will be measured in invertebrate tissues.	Analytes are now identified in new Section A7.3 based on a conference call with EPA on November 23, 2015. Tables have been revised accordingly.
16	A7.3	A-10	Clarify if the reference to "tetrachlorodibenzodioxin (TCDD)" the only dioxin needed or should the QAPP refer to 2,3,7,8-TCDD TEQs? As needed, identify specifics for TEQs - identify which source and type TEFs will be used (mammal/fish/bird) and which ND= (0/0.5/1.0) for TEQ calculation. Also indicate how the Total PCBs will be calculated - 209 congeners or TEQ for dioxin like congeners.	A footnote was added to Section A7.3.2 to describe how dioxin/furans will be evaluated. The type of ND used for the TEQ calculation is to be determined and will be discussed in the risk assessments. A footnote was added to Table A7-4 to address total PCBs calculation.
17	A7.3.1	A-10	The LOE Document indicates that the total number of sampling stations must be sufficient to meet the data needs of the risk assessments. However, the draft QAPP only indicates that a maximum of 32 locations will be sampled to obtain invertebrate tissue samples, of which 5 are expected to be internal reference samples, and no rationale is provided to support the number of stations that were selected for sampling. Describe how the selected number of stations (i.e., no more than 32 stations, where one or more types of invertebrate tissue samples will be collected) will meet the needs of the BERA or the BHHRA. See GC-7.	The sampling design has been revised, as described in new text added in Sections A7.3.1, A7.5, and B1.1; this new text describes the rationale for the sampling design and how the data will be used in the HHRA and BERA.
18	A7.3.1	A-10	State the source of information indicating that the 32 primary sampling stations cover the prime human use areas. More specifically, indicate the areas of overlap between USFWS (2013) sampling and the available CCT consumption survey data. See GC-9.	Text has been added in Section A7.3 to describe the results of the CCT survey and how the human use areas are covered in the revised sampling design. In addition, Appendix B has been added to summarize the USFWS survey data.

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19	A7.3.1	A-10	The QAPP states that the 32 sample stations include 24 FWS sample sites from 2013 mussel surveys, although Map A7-1 appears to include only 2012 mussel survey locations. It is appropriate to use the USFWS 2012 locations because the largest mussel populations were found in those locations. However, many of these locations will not be in wadeable waters at fall reservoir levels, but could be located with divers. It is important to sample at the specified coordinates as opposed to wadeable depths, for the reasons stated in the comment above. Include 2013 mussel sample locations in the study design and describe sampling locations for mussels that may need to be deeper than wadeable depths (see GC-3).	Text was revised to discuss USFWS locations. Sampling is not proposed to be conducted in water deeper than wadeable depths.
20	A7.3.1	A-10 (and Table A7-1)	The text states that 5 stations are expected to be for internal reference samples but Table A7-1 indicates that 6 stations are designated as internal reference samples. Reconcile this inconsistency.	Internal reference sample locations were removed.
21	A7.3.1	A-10	The mouth of the San Poil was identified as a significant collection point during the Colville UCR Resources Survey. Identify additional sample locations in the vicinity of the San Poil confluence to address this significant source of exposure for the HHRA. See GC-9.	Additional sample locations have been added in the vicinity of the Sanpoil confluence.
22	A7.3.1	A-11	Specify that reported results will be provided on a dry weight and wet weight basis or with moisture content and percent lipids to allow sample concentration conversion to wet weights and lipid normalized concentrations for organics. Reporting in this manner will simplify ecological risk analyses from dietary ingestion, as some studies report contaminant intake on a dry weight basis, while others report contaminant intake on a wet weight basis.	Text was added to Section A7.3.2 to specify that results will be reported on a wet weight basis.
23	A7.3.1	A-11	37 grams of mussel tissue may be difficult to obtain unless numerous live individuals are found during surveys and composited.	Target sample volumes were revised and are discussed in Section A7.3.2. If sufficient volume is not collected, analyses will be prioritized.
24	A7.3.1	A-11	The text indicates that "*soft tissue will be removed from the shell and composited prior to analysis*." It is anticipated that this statement applies to bivalve samples, but clarify the sentence to be more specific by distinguishing between sample preparation for mussels and crayfish (i.e., it does not apply to crayfish or other macroinvertebrate samples) and if mussel soft tissues will be removed from the shell in the lab or in the field.	Text was added to clarify which mussel and crayfish tissues will be analyzed. Section B3 now indicates that whole mussels will be shipped to ALS.
25	A7.3.1	A-11	Specify that soft tissues will be included in sample mass determinations for mussels (and will include the liquid inside each shell) and if (or which) crayfish tissue weights and analyses will include the carapace. Reflect these changes in the appropriate SOP/s.	Text was clarified in Section A7.3.2 and throughout to indicate which tissues will be analyzed.
26	A7.3.1	A-11	Indicate approximately how many specimens will be required to achieve the target weights for mussel and crayfish samples. Clarify a procedure to determine this from initial field measurements if numbers are not known. Reflect these changes in the appropriate SOP/s.	Text was clarified in Section A7.3.1 to indicate the target number of organisms.
27	A7.3.1	A-11	The required sample mass for crayfish tissue appears to be uncertain in this section (i.e., 47 g vs. 95 g). Clarify how much crayfish tissue samples will need to be processed. In addition, the sample processing procedures for crayfish samples need to be explicitly identified (i.e., will tissue be removed from the carapace or will the carapace be included in the tissue samples?).	Text was clarified in Section A7.3.2 and throughout to indicate the amount of tissue needed for chemical analyses.

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28	A7.3.1	A-11	Clarify if the mass requirements described for mussel samples includes split and QA samples. Only the text describing crayfish refers to splits.	Text was clarified in Section A7.3.1 to indicate the necessary sample mass for mussel and crayfish splits.
29	A7.3.1	A-11	For mussels and crayfish the length of each animal will be recorded at the time of collection. Are there any length limitations that would result in rejection of a mussel or crayfish or limit the analyses preformed on them (i.e., are there minimum sizes that would not be used for human consumption and not applicable to the HHRA)?	SOPs 3 and 4 discuss size requirements for mussel and crayfish collection. Because we are expecting to find a limited number of mussels in most areas, there is no minimum size requirement for mussels. Signal crayfish <3.25 inches in length will be released per Washington State fishing regulation requirements.
30	A7.3.1	A-11	Add a table that indicates average weight (total and tissue only for mussels) required for analyses of the indicated organisms. Also have separate columns indicating how many of each organism class would be necessary for samples scheduled for 1) all lab analyses 2) lab analyses + lab QC 3) lab analyses + lab QC + EPA Split sample analysis.	Weight required for analysis is presented in Table A7-3. Additional text was added to discuss the number of organisms needed, and a footnote added to Table A7-3 indicating additional mass needed for lab QC and EPA splits.
31	A7.3.1	A-11	Describe criteria for compositing crayfish or mussel samples to meet the minimum tissue mass requirements. Different species and size classes shall not be composited. Only similar sized organisms of the same species may be composited and it is preferable to analyze individual organisms for each sample if they are of sufficient mass.	Based on the conference call with EPA on November 23, 2015, it is acceptable to composite different species. Analysis of individual organisms is not proposed in this QAPP.
32	A7.3.1	A-11	Describe procedures for field crews to immediately report to appropriate management agencies (e.g., USFWS) where invasive invertebrate species such as zebra mussel (*Dreissena polymorpha*) or New Zealand mud snail (*Potamopyrgus antipodarum*), not currently known to be present in the Columbia River and Lake Roosevelt, are collected during sampling. Appendix A (SOP-3 and 4) should also describe how sampling gear that has been employed at other sites will be cleaned before use at the UCR so that an invasive species is not inadvertently introduced into the UCR.	Text was added to Section 2.7 descibing procedures if invasive species are encountered and of the FSP and to SOPs 3 and 4 describing how sampling gear will be cleaned to prevent the introduction of invasive species.
33	A7.3.2	A-10	This section indicates that sediment and pore-water samples will be collected concurrently from each location where benthic macroinvertebrate tissues are collected. These data are intended to be used to evaluate relationships between exposure (i.e., sediment or pore-water COPC concentration) and invertebrate tissue chemistry. However, such relationships can only be reliably developed if the exposure data are relevant for the receptor (i.e., sediment chemistry data may be relevant for evaluating exposure of juvenile mussels to COPCs, while surface-water chemistry data may be more relevant for adult mussels) and accurately represent the actual exposure for the receptor (i.e., the tissue samples and sediment samples need to be matched in time and space to be appropriate). Describe the uncertainties, or how proposed sediment sampling and chemistry, which can vary substantially over small spatial scales, is an appropriate exposure pathway for each tissue type. See GC-12.	This section was removed based on elimination of sediment and porewater sampling.
34	A7.3.2	A-12	Sediment collection should not be limited to push corers. For example, suction devise methods likely have the capacity to effectively collect finer sediments in mixed matrix environments. Describe alternative sediment collection techniques that may be needed in the various habitat types present in the UCR where tissue samples are proposed.	This section was removed based on elimination of sediment and porewater sampling.

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35	A7.3.1 7.3.2	A-10 A-12 Table A7-1	Clarify the inconsistency where the text indicates 5 reserves but Table A7-1 indicates that 6 stations are designated as internal reference samples.	The text has been changed and this comment is no longer applicable.
36	A7.3.2	A-13	Describe how representative, intact porewater samples will be obtained or refer to Section B1.2.1 where this is described. Specifically, describe how all porewater in the "hand-held push corer" will be recovered and how overlaying river water will be excluded from the porewater sample.	This section was removed based on elimination of sediment and porewater sampling.
37	A7.3.2	A-13	Clarify that hardness is "(to be calculated from Ca and Mg analyses)."	This section was removed based on elimination of sediment and porewater sampling.
38	A7.4	A-13	Identify wildlife (and fish) receptors considered in developing this QAPP and how they are described by the site conceptual model. .	Text added regarding receptors to Section A7.4.1. Section A5 discusses the CSM and ecological receptors.
39	A7.4.3	A-14	In the discussion of contaminant concentrations of tissues in invertebrates post-spawning, the text must be clarified to limit the reduction of contaminant mass in parent animals post-spawning to organic contaminants only. Metal contaminants in tissues do not vary on a lipid-normalized basis, as implied by the text as written. And while some metals and metalloids are maternally transferred to offspring via eggs (e.g. selenium), any observed mass reduction of metals in the parent animals is not related to the lipid content of the parent.	Text was removed because the timing of sampling is based on the lowest reservoir levels when mussel exposure is expected to be optimal.
40	A7.4.3	A-14	EPA did not review the USFWS QAPP; therefore, it should not be assumed that the data from that study was designed for risk assessment or that it would be accepted for use in the RI/FS. This section does not justify limiting sample collection to the late summer/fall. In fact, the FWS mussel and crayfish surveys were conducted in the spring to coincide with maximum reservoir drawdown and enabled FWS to access habitats that are not accessible at other times of the year. In addition, FWS surveys utilized both shoreline surveys and deeper-water surveys (i.e., using divers). Clarify how mussel sampling may be needed in the spring while crayfish sampling could occur in the late summer/fall and/or spring. See GC-4.	Text was rewritten in Section A7.4.3 to state that sampling is proposed only for the spring during the time of the lowest reservoir water level.
41	A7.5	A-14	The DQO step 5 is to "Define the Analytic Approach" - not just statistics and types of inferences. Further discuss the analytical approach including the specific data needs and associated processing and analysis required (i.e. which analyses are required, at what sensitivity -according to criteria referenced- and why. This shall include a detailed discussion of the processing approach required for all the different biota matrices and reference attached SOPs from the lab. See GC-15.	Text was added to Section A7.5 to discuss the analytical approach; the text refers to the SOPs for details on sample processing.
42	A7.5.2	A-15	Clarify why the statistical comparison of reference area tissue concentrations to site tissue concentrations is performed using upper tolerance limits of the reference area tissue concentrations or provide other examples of how this comparison may be done. Hypothesis testing of reference animal mean (or median) concentrations to site concentrations would also identify differences in tissue concentrations between reference and site tissues. Also indicate the minimum number of samples required for these statistics.	The text regarding statistical comparison of reference area tissues was deleted because reference envelope comparisons are not longer proposed.

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43	A7.5.2	A-15	Discuss how the concentrations of nutritionally essential elements in tissues of the invertebrates might be interpreted. Copper, cobalt, manganese, selenium and zinc are all essential elements for invertebrates, which have the capability to regulate their tissue concentrations of essential elements within narrow concentration ranges. Unless the homeostatic regulatory processes of the invertebrates are overwhelmed by elevated metal concentrations in sediment or water, it is likely that the concentrations of essential metals will be relatively constant for each species throughout the site. Note that the nutritionally required concentration of each essential element can vary by species, and how elevated copper is expected due to the copper-based hemocyanin respiratory pigment in *Pacifastacus leniusculus*. Based on peer-reviewed information in the literature, and data collected during the BERA for the Portland Harbor Superfund site, Pacifastacus leniusculus has the copper-based hemocyanin as its respiratory pigment instead of the more common iron-based hemoglobin (Rutledge, P.S. 1981. Am J Physiol 240:R93-98). Although not unusual for invertebrates, the presence of hemocyanin means that P. leniusculus likely contains higher concentrations of copper in its tissue to meet its nutritional requirements for this essential element than do most if not all other invertebrate species proposed for collection in the BMI tissue QAPP. This is not a reason to preclude collection of P. leniusculus, but will result in higher dietary doses of copper to both wildlife and human consumers of this species of crayfish.	It was not considered necessary to include in the QAPP a description of how data will be interpreted. However, this information is acknowledged and will be discussed in the BERA.
44	A7.5.3	A-15/A-16	Mussels/clams, and to some extent crayfish, detoxify elevated metal concentrations in part by sequestering excess metals in their shells and carapace. Soft tissues of invertebrates may contain relatively lower metal concentrations, while the shell or carapace metal concentrations may be more closely related to changes in exposure media concentrations (i.e. sediment, water, porewater) than are the soft tissues. Clarify whether the crayfish carapace will be included in the analysis of the "remaining tissue" (page A-11) or "removed prior to compositing and analysis" (Appendix A, page A-8). Describe how exposure models for wildlife consuming both soft and hard tissues from BMIs will be informed by these data.	A description of the tissue types to be analyzed is included in Section A7.3.2.
45	A7.5.3	A-15/A-16	This section describes the *in situ* sediment COPC bioavailability assessment that will be conducted using study data. This analysis assumes that the sediment chemistry and pore-water chemistry data collected at each station provide the necessary and sufficient data for characterizing exposure of mussels or crayfish. Provide data, references, and discussion of the conceptual site model supporting these relationships and how media will be collected that is representative of exposures concentrations for organisms sampled for BMI tissue.	Text was removed based on elimination of sediment and porewater sampling.
46	A7.6.1	A-16	Describe the minimum number of samples (for each species and from each area where wildlife or fish exposure modeling are expected to be conducted) that are needed to meet data quality objectives (e.g., statistical uses of the data).	Text was removed based on elimination of sediment and porewater sampling.

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47	A7.6.1	A-16	Specify the goal for analytical completeness. Given the limitations which may be present for sample size leading to reduced analyses being conducted (according to priority list), what is the minimum data set /results from the 100% collected locations that will allow for the risk assessment to be successfully completed?	Text discussing analytical completeness is presented in Section B5.2. Section A7.5 explains that a maximum concentration can be used as the exposure point concentration in the risk assessments in the event that less than three composite samples are collected in a sampling area.
48	A7.6.2	A-17	Data Quality: This section of the document describes the samples that will be collected to support evaluation of data quality. In this section, it is noted that field replicate sediment samples will be collected at 10% of the locations. This description indicates that the replicates will be closely co-located sediment grabs. However, multiple replicates from a larger area may also be needed to describe variability in the exposure media relevant to tissue exposures (e.g., if tissue samples were collected within a 50 m radius, then the sediment samples should be collected from locations at least 50 m apart). Include replicate sampling over a larger area representative of BMI exposure that will provide the information needed to determine how best to match the sediment chemistry and tissue chemistry data that are collected in the study.	Text was removed based on elimination of sediment and porewater sampling.
49	A7.6.2	A-17	EPA will collect splits of sediment and pore water samples for independent confirmation of analytical results. Describe the need for EPA splits of 15% of sediment and pore water samples. Describe the sample mass required for EPA splits (i.e., text and Table A7-2) and include in the analysis prioritization.	Text was removed based on elimination of sediment and porewater sampling.
50	A7.6.2	A-17	Reference (at the end of the second paragraph) where the specific quantitative limits for these parameters are identified in the QAPP.	Text was added to refer to Tables A7-4 and A7-5.
51	A7.6.2	A-17	Third Paragraph. The field duplicate/replicate results should be used to indicate heterogeneity of the sampled population. Clarify that limits on RPD are not applicable to these field duplicates as part of analytical data validation. It is appropriate for these criteria to apply to splits of the same composite sample, which theoretically, if homogenized sufficiently, should yield the same result.	Text was revised to clarify that field split samples will be collected as homogenization splits prepared in the laboratory. RPD limits would apply to these splits, therefore text was not added regarding inapplicability of RPD limits.
52	A7.6.2	A-17	Indicate the target frequency for replicate field tissue samples for each species collected.	Text was added in Section A7.6.2 regarding target frequency of collection for field splits.
53	A76.2	A-17	Equipment rinsate blanks - The draft QAPP describes a large volume for a water for analysis of all COPCs which effectively would dilute the rinsate. Revise the procedure to indicate that a minimal rinse volume will be used and captured to assess rinsate blanks. This could be accomplished by only analyzing metals and not all organics.	Text was revised in Section A7.6.2 to clarify how equipment rinsate blanks will be prepared.
54	A76.2	A-18	Add descriptors for dioxins and PCB congeners - EDLs/ EDC/EMPC etc.	Text was added in Section A7.6.2 to describe reporting for dioxins/furans and PCBs.
55	A9.2	A-19	Specify if the ALS lab in Kelso, WA, will be used for all analyses, including the high res PCB congeners, dioxin, etc.	Text was clarified in Section A9.2 to indicate that ALS and Vista Analytical will conduct the sample analyses.
56	A9.2	A-19	The list of documentation requirements shall include copies of the chain of custody forms accompanying samples.	Text was revised in Section A9.2 to include COCs.
57	A9.2	A-19	"Interference checks" are specific QC to metals analysis but not the other tests being performed. Update to indicate all parameters' QC or provide more general summary of the QC requirements (according to the analytical method).	Text was revised in Section A9.2 to include QC samples applicable to metals and organics analyses.

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58	A9.2	A-20	Specify documentation/logs for sample processing and include an example of these in the QAPP appendices or associated SOP. Supporting documentation/logs for percent solids/moisture, lipids, extraction, digestion, clean up, grain size, etc. will be needed for data validation.	Text was revised in Section A9.2 to include copies of sample processing forms. Example laboratory bench sheets are included in Appendix C.
59	A9.3	A-20	The draft QAPP states that high resolution photography will be used for taxonomic identification. That is not typically how macroinvertebrate identification is performed. Confirm that this approach can be accomplished by a qualified taxonomist for species known to occur in the area. Discuss tradeoffs and uncertainties associated with this approach compared to typical where. specimens are examined. While it is understood that specimens taken for tissue analysis cannot also be shipped to a taxonomic lab, if there is sufficient abundance at a sampling site to create pseudo-split samples (some specimens for chemistry, some for taxonomy - giving chemistry first priority), those specimens should be retained and provided to the selected Taxonomist.	Text was removed based on elimination of sediment and porewater sampling.
60	B1.1	B-1	Target Sample Locations and Rationale: Describe the rationale for selecting the target sampling locations. While some general information is provided in this section, additional details are needed describing the rationale for the 26 non-reference sample locations identified in Map A7-1 and Table A7-1. In addition, the decision to sample wadeable habitats (only) needs to be justified if not changed to address other comments.	Text was revised. The decision to sample only wadeable habitats is a policy decision by TAI based on health and safety concerns rather than a technical issue, therefore a technical rationale was not included.
61	B1.2	B-1	The draft Plan states that "*Concentrations of COPCs in macroinvertebrate tissues are likely to correlate to bioavailable concentrations of the COPCs in sediment or porewater, and not total recoverable concentrations*." This may have some grounds theoretically, but expecting to see this at the UCR with data collected from this field is uncertain. Revise the sentence to state that "Concentrations of COPCs in benthic macroinvertebrate tissues ~~are likely to~~ may correlate ~~to~~ with bioavailable concentrations of the COPCs in sediment or porewater, and not total recoverable concentrations."	Section was removed based on elimination of sediment and porewater sampling.
62	B1.2	B-1	Bioavailability Measurements: This section of the QAPP indicates that the concentrations of COPCs in invertebrate tissues are likely to correlate to bioavailable concentrations of COPCs in sediment and pore water. Accordingly, AVS/SEM, TOC, and ionic composition will be measured in sediments, while dissolved metals, dissolved organic carbon (DOC), pH and ionic composition will be measured in pore water. Inclusion of these analytes is likely to support evaluation of the bioavailability of COPCs in sediments and pore water. However, a much larger issue relative to developing correlations between the various indicators of exposure to COPCs (i.e., sediment chemistry, pore-water chemistry, surface-water chemistry) and tissue chemistry is how to collect representative samples of sediment and pore water that can be used in this process. Collecting a single core at each location will not provide a relevant basis for characterizing exposure of invertebrates to COPCs. Propose a more robust sampling design needs to be developed if the goal of the study is to formulate relationships between COPC exposure and tissue chemistry.	Section was removed based on elimination of sediment and porewater sampling.

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63	B1.2	B-2	Bioavailability Measurements - Include lipids in these analyte descriptions to describe how measured concentrations of organics may be lipid normalized.	Section was removed based on elimination of sediment and porewater sampling.
64	B1.2.1	B-2	Describe the specific volume of pore water needed for proposed analyses.	Section was removed based on elimination of sediment and porewater sampling.
65	B1.2.1	B-2	Specify the type/material of 0.45 um filter.	Section was removed based on elimination of sediment and porewater sampling.
66	B2	B-3	Reference to field decisions must include consultation with EPA or it's designates in the field. Revise the third paragraph as follows: "...the field supervisor, in consultation with EPA or it's designates in the field, will institute the necessary corrective actions..." And "Any problems that cannot be easily resolved...will be brought to the attention of ...and EPA (and EPA's designates in the field)."	Text was revised as follows: "...the field supervisor, in consultation with EPA or its representative in the field, will institute the necessary corrective actions..." And "Any problems that cannot be easily resolved...will be brought to the attention of ...and EPA (and EPA's representatives in the field)."
67	B2	B-3	Revise the sentence as follows: "If corrective actions require a departure from the FSP, these changes will be documented on a field change request form (refer to Appendix A for examples of these and other forms) and submitted to EPA for review and approval."	Text was revised in Section B2 as indicated.
68	B2	B-3	The text refers to SOPs "*provided in Attachment 2 of the FSP*." The draft QAPP contains no Attachment 2 (this should be Attachment A2 of Appendix A), while the draft field sampling plan is Appendix A of the QAPP. Correct the call-outs in the main QAPP text for items found in the FSP.	The call-outs throughout the document have been updated.
69	B3	B-4	Indicate that the cooler temperatures will also be checked upon receipt by the lab.	Text was revised in Section B3 to indicate that cooler temperatures will be measured upon receipt at the laboratory.
70	B3	B-4	Describe (generally) how tissues will be shipped (in shell/whole) and stored prior to/during shipment (frozen or cold?).	Text was added to Sections B3 and B4 detailing sample shipping and storage.
71	B-4	B-4	This section needs much more detail on sample processing. Give overview of processing techniques specific to each biota matrix and reference the sample processing SOPs from ALS. These should also include example processing forms to be used by the lab.	Text was added to Section B4 regarding sample processing. Examples of laboratory bench sheets are included in Appendix D.
72	B4.1	B-5	Note timeframe criteria within which the porewater will be extracted from field collection and/or lab receipt.	Text was removed based on elimination of sediment and porewater sampling.
73	B5.1	B-5	Analytical Laboratory Quality Control: This section of the QAPP describes the measures that will be taken to support evaluation of data quality. However, it does not appear that standard reference materials (SRM) will be analyzed to support evaluation of the accuracy of analytical data (i.e., unless laboratory control samples [LCSs] are standard reference materials; if so, this should be explicitly stated and the sources of those materials should be identified). Clarify that LCS is a synonym for SRM or add the use of SRM to support evaluation of the accuracy of analytical data. Also indicate their frequency of use (e.g., 1/batch?) and identify the specific SRMs for each analysis.	Text was revised in Section B5.1 to include information regarding SRMs. Detailed SRM information (e.g., names, control limits, and frequency of analysis) is included in Table B5-1.

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74	B5.1	B-5	Sample processing is not necessarily covered by an analytical method and associated QC needs to be specified here.	Text was added to Section B5.1 to include discussion of equipment rinsate blanks and field splits.
75	B5.1	B-5	The QC identified here are specific to metals, however a much broader range of analyses are being conducted in this project. Describe other QA protocols associated with non-metals.	Text was revised in Section B5.1 to include QC relevant to organics analyses.
76	B5.2	B-6	The formula for relative percent difference, percent recovery for matrix spiked samples and the percent recovery for reference materials are presented two or three times each on the same text line. One presentation will suffice.	Text was revised in Section B5.2 to exclude redundant information.
77	B5.2	B-6	Explain why the acceptable relative percent difference (RPD) for acid volatile sulfide is 45 and the RPD for simultaneously extracted metals is 30, while the acceptable RPD for metals is 20 in Table B5-2.	Text was deleted because it is no longer applicable. Measurement quality objectives were updated in Table B5-2.
78	B5.2	B-6	Update the last sentence on this page to include equipment rinsates and processing contamination.	Text was revised in Section B5.2 to indicate that equipment rinsate blanks will assess potential contamination from sample processing.
79	B5.2	B-7	The QC identified here are specific to metals, however a much broader range of analyses are being conducted in this project. Describe other QA protocols associated with non-metals.	Text was revised in Section B5.2 to include QC specific to organics analyses.
80	B5.2	B-7	It is correct to qualify analytes detected at concentrations between the MDL and MRL with a "J' qualifier. However, Method 1631E has specific requirements on what can be reported. Clarify that the HR GC methods use other terminology for detection and reporting limits.	Text was clarified in Section B5.2 to include terminology for organics analyses.
81	B5.2	B-8	Revise the sentence as follows: "MDLs and MRLs will be adjusted..."	Text was revised in Section B5.2 as indicated and to include terminology for organics analyses.
82	B5.2	B-8	Indicate if biota and sediment samples be reported wet weight or moisture corrected.	Text was added to Section B5.2 to indicate wet weight basis sample reporting.
83	B7	B-9	Remove the reference to an EPA standards repository providing any analytical standards. All lab stock standard solutions will be purchased by the laboratory and, as indicated, traceable to NIST or in accordance with the labs accreditation requirements.	Text was removed in Section B7 as indicated.
84	B9	B-10	Add a reference to the draft UCR RI/FS Data Management Plan No. 1 (TAI 2010). TAI. 2010. Data management plan: Amendment No. 1. Prepared by Exponent, Bellevue, Washington. 132 p.	The reference for the draft data management plan was added in Section B9.
85	B9.1	B-11	Specify the format for recording and reporting GPS coordinates (e.g., WGS84, decimal degrees, to minimum 5 decimal places).	Text added in Section B9.1 to indicate the coordinate format for recording and reporting.
86	B9.1	B-11	Specify how the coordinates will be identified for composites of benthic biota collected over an area (e.g., centroid of four corners)?	This information is specified in SOP-1 (Recording Macroinvertebrate Tissue Sample Collection Locations)
87	C1	C-1	Indicate that there will be EPA assessment / oversight of sampling and lab processing or analysis as directed by the EPA RPM.	Text was added to Section C1 as indicated.
88	C1	C-2	Reference to deviations from the QAPP must be communicated to EPA. Revise the fourth paragraph as follows: "Any confirmed non-conformance issues will be communicated to the TAI technical team coordinator and to EPA."	Text was revised in Section C1 as indicated.

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89	C2	C-3	*"Laboratory non-conformance issues will also be described in the field sampling report if they affect the quality of the data."* Describe how it is determined if a non-conformance issue affects the quality of data.	Text was added to Section C2 to indicate that the data validator will evaluate the data for laboratory non-conformance issues.
90	D1	D-1	Refer to the NFG for PCDD/PCDF data review (EPA, 2011).	The reference for dioxins/furans NFG was added to Section D1.
91	D1	D-1	Arsenic speciation, PCB congeners, MeHg, and low level THg are also not included in the referenced NFGs.	Text as added to Section D1 to indicate that analytes not covered by the NFG will be validated according to method and QAPP requirements.
92	D1	D-1	As noted, these methods are not covered in the CLP SOWs and therefore clarify that data validation would be performed in accordance with the analytical method and QAPP requirements.	Text was added to Section D1 to indicate that analytes not covered by the NFG will be validated according to method and QAPP requirements.
93	D2	D-2	Indicate that a data validation qualifier table will be provided with definitions for the lab and validator applied qualifiers.	Text was added to Section D2 to indicate that qualifier definitions will be provided by the data validator.
94	D2	D-2	Stage 4 validation (10% of data) may not be appropriate for the analyses being conducted. Validation would only consider a few batches per analysis given the few planned samples (~50). Indicate the minimum number of samples that will undergo validation.	Text was revised in Section D2 to indicate that Stage 4 validation will be conducted for approximately 10 percent of the data or data for at least 12 samples, whichever is greater.
95	Maps	Map A7-1	Individual sampling locations in Marcus Flats cannot be clearly identified. Provide detailed maps of the sampling areas that show depth contours. This will assist field crews in selection of the appropriate sampling gear to use at a site, and help to ensure that areas that too deep to be accessible to terrestrial ecological receptors are identified. If bottom substrates and available fish habitats are known or can be inferred at sampling locations, such information when plotted on site maps would be useful in identifying locations where invertebrates available for consumption by demersal fish may be present, and could guide field sampling efforts.	Detailed maps with bathymetry contours are provided.
96	Tables	Table A7-2 (and Appendix A Table A2)	Several of the sample masses required for analysis appear unnecessarily high and may reduce the likelihood of successful sampling. Identify alternative analyses that require less tissue but retain the minimum reporting limits (e.g., metal analyses generally require no more than 2 grams of tissue, not 3 grams and the USGS routinely conducts metal analysis in tissues via inductively-coupled plasma spectrometer (ICPS) with less than 1 gram of tissue). Methyl and total mercury concentrations are also routinely measured in less than 1 gram samples.	The target sample masses listed in Table A7-3 are the minimum masses required by ALS for the metals analyses and the taget masses for PCBs and dioxins/furans to achieve the lowest QLs.
97	Tables	Table A7-2 (and Appendix A Table A2)	Minimum tissue mass requirements directly dictate the number of individual animal samples needed from each sampling location to obtain the proposed tissue mass. Soft tissue mass of individual *Corbicula fluminea* range between 0.1 gram wet weight tissue in 1 cm wide clams to about 1.5 grams wet weight tissue in 4 cm wide clams. Individual adult signal crayfish (*Pacifastacus leniusculus*) can easily weigh more than 30 grams/individual. To obtain sufficient mass of smaller soft bodied benthic species such as insect larvae for chemical analyses will likely be difficult unless a large volume of material is processed either in the field or in a laboratory. Provide a table of the approximate numbers of individual animals of each species that need to be collected by field crews from each sampling location to reach the desired mass of tissue for chemical analyses.	Table A7-2 (Target Number of Samples to be Collected) was added to address this comment

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98	Table A4-1	1 of 1	Add: Jennifer Crawford / EPA QA Chemist / 206-553-6261 / crawford.jennifer@epa.gov	Text was added to Table A4-1 as indicated.
99	Table A4-1	1 of 1	Include "Region 10" as part of the EPA QA Manager title/role.	Text was added to Table A4-1 as indicated.
100	Tables	Table A7-2 and A2	Specify if dry weight or wet weights are indicated.	Footnote was added to Table A7-3 to indicate that all weights are on a wet weight basis.
101	Tables	Table A7-2	Include prioritization of analyses in this table. It is not clear if the 'order of priority' is the order analytes are listed.	Analysis priorities were added to Table A7-3.
102	Tables	Table A7-2	Describe sample volumes, holding times, preservation, and prioritization for pore water and sediment samples as shown in Appendix A, Table A3.	No longer applicable based on removal of sediment and porewater sampling.
103	Tables	Table A7-2/A7-3	Tables A7-2 and A7-3 are confusing because they repeat information (i.e., analysis method), but do not indicate information consistently for all media (e.g., no minimum sample sizes for porewater or sediment). Create separate tables for each sampled media that each present the appropriate information from Tables A7-2 and A7-3. Medium specific holding times, containers, and analytical methods must be indicated.	All indicated information for tissues is included in Table A7-3. Other matrices are no longer applicable.
104	Tables	Table A7-2	Add lipids.	Information for lipids was added to Table A7-3.
105	Tables	Table A7-2	Include the prep method for each analysis (e.g., 3052 is what the R10 lab typically uses for tissues, on freeze dried material).	Sample preparation methods were added to Table A7-3.
106	Tables	Table A7-2	Change the holding time for metals in tissues 180 days	Holding time was changed in Table A7-3 as indicated.
107	Tables	Table A7-2	Update the total mercury analysis method to "1631E-M" and place on a line separate from methyl mercury. Both 1630 and 1631E would need to be modified for tissue analysis as they are written specifically for water analysis. Include the lab SOPs for these since the method doesn't cover tissue analysis. Typically the CVAAS analysis of Total mercury in tissue can meet project criteria. If so, would recommend EPA 245.6 instead of 1631E (this is the method the EPA lab will use for any split sample analysis).	Analytical methods are listed in Table A7-3. SOPs are included in Appendix C. ALS does not conduct EPA 245.6, however the project criteria are met with EPA 1631E.
108	Tables	Table A7-2	Provide a reference for the source of these holding times, as there are not EPA established holding times for MeHg or T-Hg in tissues. Typically we would reference at least a 6 month holding time for frozen or freeze-dried fish.	Footnote was added to Table A7-3 to reference the SOPs (Appendix C).
109	Tables	Table A7-2	Add a footnote indicating how Total DDx will be calculated/summed.	No longer applicable.
110	Tables	Table A7-2	Clarify the preservation - in this case, what is the maximum holding time for tissue samples from collection in the field to receipt at the lab (at 4°C) before they are processed? Also clarify the holding time and method (i.e., frozen) for tissue samples after processing.	Holidng time information was added to Table A7-3.
111	Tables	Table A7-2	Clarify if "Total PCBs" is a placeholder for all 209 PCB congeners and how total PCBs will be calculated/summed.	Text was changed to "PCB congeners" in Table A7-3. Detail regarding calculation of total PCBs is included as a footnote to Table A7-4.
112	Tables	Table A7-2	Clarify if 2,3,7,8-TCDD the only congener required from the entire PCDD/PCDF analysis, or if "TCDD" refers to a determination of the 2,3,7,8-TCDD TEQ?	Text waa changed to "Dioxins/furans" in Table A7-3.
113	Tables	Table A7-2	Add a note that the minimum laboratory sample sizes identified are likely only enough for one digestion/extraction/analysis at the laboratory and not for further re-work if analytical or matrix related issues are encountered.	Note was added as indicated to Table A7-3.
114	Tables	Table A7-2	Indicate a minimum volume and priority list for porewater.	No longer applicable based on removal of sediment and porewater sampling.
115	Tables	Table A7-3	TOC and grain size must be listed for sediment analysis.	No longer applicable based on removal of sediment and porewater sampling.

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116	Tables	Table A7-3	Indicate which elements are analyzed by ICP-AES and ICP-MS for each matrix	Information was added as a footnote to Table A7-3.
117	Tables	Table A7-3	Indicate the prep methods for all EPA methods where they are separate from the determinative step, and add the version for 6010(C?) and 6020A.	Text was added to Table A7-3.
118	Tables	Table A7-3	Methods 1631 and 1630 are CVAFS	Analytical procedure was revised in Table A7-3.
119	Tables	Table A7-3	Remove the 7000 series - should be achievable by 6010/6020	Analytical methodswere updated in Table A7-3.
120	Tables	Table A7-3	Be consistent among tables. Only TCDD is indicated in Table A7-2.	Tables were revised to make language consistent.
121	Tables	Table A7-3	Be consistent among tables. Only two specific phthalates are indicated above in Table A7-2.	Tables were revised to make language consistent.
122	Tables	Table A7-3	Specify the analytical method for determining hardness from the Ca and Mg results (i.e., calculated using Standard Method 2340B).	No longer applicable based on removal of sediment and porewater sampling.
123	Tables	Table A7-4	Section A7.3.2 indicates that grain size, pH, acid volatile sulfides (AVS), simultaneously extracted metals (SEM), total organic carbon (TOC), and the complete list of refined COPCs for macroinvertebrate tissue samples will be measured in sediments. However, Table A7-4 does not include Cr(III), methyl mercury, total Ddx (i.e., DDD, DDE, DDT) or bis(2-ethylhexyl)phthalate. Include these COPCs in Table A7-4 or explain why they are excluded.	No longer applicable based on removal of sediment and porewater sampling.
124	Tables	Table A7-4	A number of the risk based concentrations (RBCs) for human health risks are lower than the proposed analytical chemistry method detection limits (MDLs). This is a concern because it leads to the possibility that potential risks may not be identified because of poor detection limits. Identify methods with lower MDLs or confirm that the lowest MDLs available are being targeted.	The lowest MDLs and MRLs that the laboratory can achieve are listed in Table A7-4.
125	Tables	Table A7-4	Confirm that the wildlife RBC/5 values are all higher than the MDLs for all avian, mammalian, and fish species for which dietary dose TRVs are available. Provide interim dietary TRVs (for planning purposes in the QAPP) for quantifying risks to fish and aquatic dependent wildlife on which to further assess ACGs. This information shall be presented in a separate table indicating the receptors and summarizing the data used in calculations to derive wildlife RBCs (per footnote b in Table A7-4).	The SLERA and Sample et al. (1996) are referenced as the source of TRVs and the information used to calculate wildlife RBCs is presented in a footnote.
126	Tables	Table A7-4	Confirm that 2015 ACGs are available based on current ALS MRL and MDLs? It is unclear if the table has been updated since the tissue MRLs/MDLs are not provided below.	Table A7-4 has been updated and includes current MDLs and MRLs.
127	Tables	Table A7-5	Table 7-5 reported method detection limits (MDLs) and method reporting limits (MRLs) for pore-water analytes in mg/kg dw; these units need to be corrected. Also confirm that the MDLs that will be achieved for certain analytes are sufficient to evaluate relationships between pore-water concentration, sediment concentrations, and tissue concentrations (e.g., 5 µg/L for cadmium; 30 µg/L for copper, 90 µg/L for zinc).	No longer applicable based on removal of sediment and porewater sampling.
128	Tables	Table A7-5	Correct the MDsL and MRLs for porewater to be on a water basis (ug/L or mg/L) instead of mg/kg dw.	No longer applicable based on removal of sediment and porewater sampling.
129	Tables	Table B5-1	Include missing analytes such as mercury, lipids, and percent moisture.	Table B5-2 was revised to include all analyte groups.
130	Tables	Table B5-1	Indicate that "total PCBs" is the sum of individual PCB congeners and clarify if the objectives apply to each congener.	Analyte groups were revised to be consistent among tables. Footnote was added to Table B5-2 to indicate that control limits apply to each congener.

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131	Appendix A, Section 2.1	A-4	"*Included in these 32 stations are the 24 sites sampled as part of the U.S. Fish and Wildlife Service (USFWS) UCR shoreline mussel survey.*" Provide reference(s) for the USFWS data.	Text was removed; comment is no longer relevent based on revised sampling scheme.
132	Appendix A, Section 2.2.2; SOP-1, 6	A-5	Insufficient information is provided to determine if representative sediment samples will be collected at each location as the draft QAPP only describes a single sediment core and sediment pore water sample from each tissue location. This may not be sufficient to describe sediment and pore water contaminant concentrations at each tissue sampling location. Mussels and crayfish are likely to be collected within different areas of a station, depending on habitat preference. Describe the rationale and criteria for collecting additional sediment and pore water core samples to define sediment and pore water contaminant concentrations in the vicinity of crayfish traps or mussel collections. Consider how core samples will sufficiently characterize small-scale spatial variability in sediment COPC concentrations, such that the results can be linked to macroinvertebrate tissue concentrations. See GC-12. Variation in the field duplicate sediment samples from the 2013 sediment sampling may provide useful information in determining contaminant concentration differences within an area of the size needed to obtain the desired mass of invertebrate tissues for chemical analysis, as well as how many sediment and pore water samples should be collected from a single tissue sampling location.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
133	Appendix A, Section 2.2.2; SOP-1, 3, 4, 5	A-5	Although the QAPP contains discussions in several locations about the patchiness and lack of habitat for benthic species in some parts of the UCR site, there is no discussion how far away from the sampling location coordinates field crews should attempt to collect benthic tissue samples. For example, the phase 2 sediment sampling QAPP (TAI, 2013) defined a circle with a 150 foot radius around sample coordinates in which sediment could be collected. However, it is important to subjectively place traps and conduct surveys in appropriate habitats in order to find mussels and crayfish (and appropriate habitat may not be in wadeable areas). Unlike the sediment study, the study design should allow flexibility such that samplers may move within a reasonable distance of the target sampling location if suitable habitat is not found at the target location, but can be found nearby. For example, if a sampling site turns out to be located on a steeply sloping beach, and a flat or gently sloping beach is located just upstream, then mussel surveys should be conducted on the flat or gently sloping beach. Likewise crayfish traps should be placed along steep, rocky shorelines or rocky bottoms. It should also be noted that in many areas of the UCR these macroinvertebrates will not occupy the same locations if suitable habitats are not present. Discuss the importance of habitat selection when targeting BMI tissue sample collections and if there is a limit beyond which tissue samples should not be collected from the sample coordinates in Table A-1/A7-1.	Comment was addressed as part of revised sampling scheme. To allow for the flexibility described in this comment, the revised sampling scheme specifies sampling areas, and then indicates that the field crew (with EPA oversight) will identify specific sampling location based on available habitat and to provide good spatial coverage of the overall sampling area.

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134	Appendix A, Section 2.2.4	Page A-6	This section describes "*...sediment and pore water sampling methods that will be implemented in the field. ...supported by SOPs and summarized in Section 2.2.4.1*" However, pore water sampling methods are not described other than sending sediments to a lab. Section B1.2.1 describes centrifugation of intact cores. Indicate the methods for pore water extraction that will be performed in the lab (i.e., centrifugation). Further clarify the number of intact core samples that are required to allow pore water sample volumes meeting analytical needs (moisture/grain size dependent), how multiple cores may need to be composited, any filtration that is planned. Further clarify that preservation for different chemical analyses, described in Table A3, applies to pore water extracted from intact cores at the lab.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
135	Appendix A, Section 2.2.4	Page A-6 and A-7	"*If sampled habitats are located over a large area, multiple sediment samples may be required*." Define what a "large area" is for multiple sediment sample collection and describe the number of samples that will be collected per unit area.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
136	Appendix A, Section 2.2.4	Page A-7	The field plan states that "*Sediment samples should be collected prior to macroinvertebrate sampling and crayfish trap deployment*." Change the priority to clarify that tissue collection is the primary objective of this QAPP and sediment and/or pore water samples are only needed where tissue samples are also collected. Sediment and pore water sampling limitations will not dictate tissue sample locations.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
137	Appendix A, Section 2.2.4	Page A-7	Third bullet: "*Overlying water is present*" Explain how the overlaying water is removed to avoid dilution of porewater.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
138	Appendix A, Section 2.2.4.1	Page A-8	Note that, to our knowledge, Yukon floaters have not been documented in the UCR. Shells resembling Yukon floater shells have been observed in the UCR by FWS, and it was speculated that they may have been this species.	Text was revised to indicate that Yukon floaters may be collected if present, and this species is noted to be a historical population.
139	Appendix A, Section 2.2.4.1	Page A-8 to A-10	Clarify that the separation of soft tissues from mussel and clam shells, and from the carapace of crayfish if that will be done, is to be performed at the ALS laboratory, not in the field.	Text was revised in Section 2.2.4.1 and 2.2.4.2 to indicate that the separation of tissue for mussels and crayfish will be done at the analytical laboratory (not in the field). This is also noted in SOP-3 and SOP-4.
140	Appendix A, Section 2.5	A-17	State the maximum allowable time from sample collection to laboratory preparation (not analysis) of macroinvertebrate samples.	Comment was addressed as part of revisions to Table A7-3 of the QAPP.
141	Appendix A, Section 2.5	A-17	Clarify if all samples will be shipped to the laboratory on dry ice or wet ice. The FSP states "samples will be packed on dry ice." SOP-3 appears to specify mussel storage with wet ice. SOP-4 appears to specify crayfish storage with wet ice. SOP-5 appears to specify epifauna and infauna storage with wet ice.	Text was revised throughout the FSP and SOPs to state that samples will be shipped using wet ice.
142	Appendix A, SOP-3	Pages 1 to 2	Additional sampling details are needed in this SOP. SOPs end with bags of mussels sent to the lab. Describe mussel sample processing prior to analysis (e.g., removing soft tissue and weighing prior to compositing)?	SOP-3 was revised to include information related to laboratory processing.

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143	Appendix A, SOP-4	Pages 1 to 4	Additional sampling details are needed in this SOP and it is not clear if shells/carapace will be removed from the remaining crayfish before analyses. Describe crayfish sample processing prior to analysis (e.g., separating tails meat from the remainder of the crayfish, weighting each part (to allow recalculation of whole organism concentrations), and including the carapace with the remainder for analysis). If only soft tissue or muscle tissue is analyzed it will not necessarily represent piscivorous wildlife consumption.	SOP-4 was revised to include information related to laboratory processing.
144	Appendix A, SOP-4	Page 2	The procedures describe how cat food will be used to bait traps. Other bait (i.e., hot dog pieces, cut-up pieces of fish, and fish oils) as stated in the LOE) may be more successful and the SOP should describe the use of alternative baits if additional trapping effort is needed after the first removal.	SOP-4 was revised to include these other bait options.
145	Appendix A, SOP-4	Page 2	Describe how traps with escape guards should be used and bait placed in cheesecloth or nylon bags that cannot be torn open by crayfish claws. Crayfish consumption of bait may bias the chemical analyses.	SOP-4 was revised to state that bait in crayfish traps will be enclosed in a claw-proof bag.
146	Appendix A, SOP-4	Page 2	The FSP and SOP-4 indicate that traps will be checked after three days. Leaving crayfish in traps for three days will increase the chance of death/decomposition and predation resulting in unusable specimens, escape from the traps, and consumption of bait (if bait is to be withheld). Revise the SOP to indicate that traps will be checked once every 24 hours.	SOP-4 was revised to state that traps will be checked twice daily (mornings and evenings).
147	Appendix A, SOP-5	Page 1	Additional sampling details are needed in this SOP. Sorting BMI from kick-net or D-net sample debris can be very time consuming and can require forceps, light tables, and magnifying lenses. This equipment should be added to the listed field equipment and materials. Also clarify if BMI captured in cover (e.g., caddisflies in houses) will be removed. A contingency to process samples in the lab should also be described.	Text was removed; comment is no longer applicable based on removal of epifauna and infauna sampling.
148	Appendix A	SOP-6, Page 1	Additional sampling details are needed in this SOP. Describe the type and diameter of the hand corer, if core liners or core catchers will be used, and estimate how many grabs may be needed to meet the target sample volumes for both pore water and sediment. Also expand the description of how cores will be removed from the sampler so that only the top 10-15 cm will be collected.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
149	Appendix A	SOP-6, Page 1	Sediment Collection Using a Hand or Push Core Sampling Device: No mention is made in this SOP concerning the correct procedure for collecting sediment samples that will be used to extract porewater. I suggest that the proper collection of sediment samples to be used for porewater extraction be specified in this SOP. Include a detailed procedure to ensure that overlaying water does not contaminate the porewater extracted from the sample.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
150	Appendix A	SOP-6, Page 1	Include a step in the sampling procedures for cultural resources observer assessment - after removing the sediment sample from the sampler.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.
151	Appendix A	SOP-8, Page 3	Specify the water depth where sediment samples and associated porewater are collected from.	Text was removed; comment is no longer applicable based on removal of sediment and porewater sampling.